QAQC Database Overview

Description

The purpose of the MWQI QA/QC database and application is to:

- Provide a central, shared repository for QA/QC sample data.
- Provide procedures, forms and other database objects for entering and retrieving the data.
- Provide analysis tools and reports.

The QA/QC data serve two basic purposes:

- To provide MWQI and outside users of the data with information related to the quality (accuracy and precision) of the data.
- To provide MWQI staff, particularly the Field Unit, with information that helps support system maintenance and operations

The application has two main components:

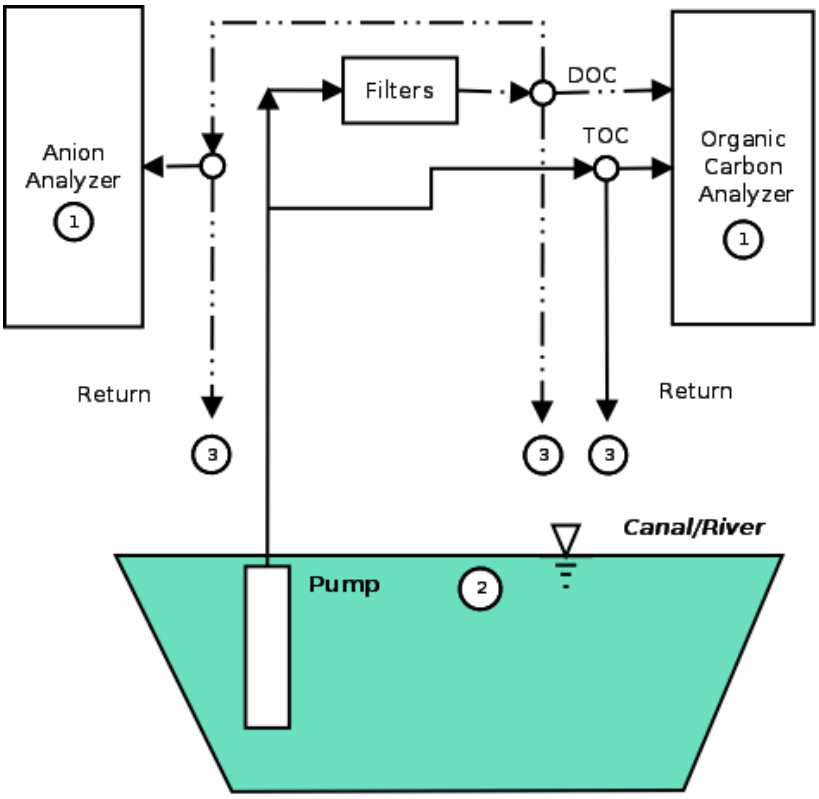
- A central database that contains sample data, certified standards data, and numerous supporting lookup tables and queries. As of July 2011, there are about 7100 samples in the database dating back to November, 2004.
- A user interface that provides basis analysis and presentation of both the data and results of meaningful statistical tests based on the samples.

Samples

A sample is a measured value of an analyte from a specific source, analyzed in a specific way or by a specific process or instrument. Where the sample measurement is used to assess the accuracy or precision of measurements, the sample concentration is the average of measured concentrations of at least four equal portions (aliquots) of the sample.

Sample Types

"Sample Type" is used as a short reference to a sample that implicitly defines information about the sample measurement. Sample Types used in the database are described below.



Field Site Sampling Schematic

Sample Types Definitions

Sample Type	***Schematic Reference***	***Description***
Online	1	The sample source is the normal sample stream at the analyzer. It includes the pumps, filters, valves and hoses and tubing. It also reflects the location of the pump intake.
Grab	2	The sample source is a grab sample taken directly from the water body, a fixed location that is as close to the automated sampler pump intake as possible. Generally, it is within 10 feet of the intake.
Matrix Spike		A grab sample is spiked with a known amount of a standard substance. The concentration of the spiked sample is then measured and compared with the expected increase in concentration computed from the grab sample concentration increased by the spike.
Standard		A sample with a concentration that is known. Potassium Hydrogen Pthalate (KHP) is the most common substance serving as a standard for organic carbon.
Certified Standard		A sample of a specified concentration provided by an accredited outside source (such as Wibby) that certifies the concentration. Various concentrations of the certified standard bracket the range of expected field values Potassium hydrogen phthalate (KHP) and nicotinamide are the substances serving as standards for the field and lab organic carbon instruments.
Delivery System Grab	3	A sample from the sampling stream where it enters the analyzer and is analyzed at Bryte Lab.
Pre-Service Online	1	The concentration measured by the analyzer immediately before the delivery system is serviced.
Post-Service Online	1	The concentration measured by the analyzer immediately after the delivery system is serviced.
Anion River Grab Injection	1	An analyzer measurement of portion of the river grab sample that injected into directly into the analyzer. (anions only)

Sample Database Contents and Structure

Sample measurements are stored in a single table in the database. (A database table is much like a spreadsheet in that data is arranged in rows and columns. In database terminology, a column is also referred to as a "field", "property" or "attribute.")

- Each row in the table roughly corresponds with a row in the original spreadsheets.
- Each row records data for a single sample.
- Each row comprises several field, each analogous to a column a spreadsheet. Some fields (i.e., columns) are always used; some are used only for specific sample types.

Sample Data Row Contents

Field/Attribute	***Description***
Measurement Date	Date of sample. Important in comparisons (i.e., tests) because it is used to select samples for comparison.
Sample Type	As defined above.
Location	Any of the field stations or Bryte Lab. Generally refers to both the sample source and the location of the measurement instrument.
Instrument	Any of the field or lab instruments or lab methods. Generally, if the location of the instrument not specified, it is assumed to be a field instrument at "Location". Bryte Lab instruments names are prefaced with "Bryte". A list of instruments and their analytes is maintained in a separate table.
Analyte	Current analytes measured by MWQI include DOC, TOC, Bromide, Chloride, Fluoride, Nitrate, Sulfate
Standard	Anion standards are known concentrations of the same analyte. KHP, Nicotinamide or Blank Water are used for DOC and TOC.
Standard Concentration	Used when appropriate. Also used for spike concentrations.
Measured Value	In most cases, this is the average of four aliquots of the original sample.
Aliquot Values	The recorded aliquot values as series of comma separate values.
Comments	Comments text.

Tests

Tests involve comparing the results of two samples or a measurement of a known standard concentration.

Where two samples are compared, they are correlated or linked by Date, Location, Instrument and Analyte as described below.

Sample Tests

Test	*Description*
Delivery Grab vs. River Grab	Reports the RPD of the two sample measurements for sample types “Delivery System Grab” and “Grab”. The former pertains only to anions. The comparisons are matched by date, location, instrument and analyte.
Pre- vs. Post-Maintenance	Used by the Field Unit to monitor the effectiveness of the sampling system maintenance schedule. Reports the RPD of the two sample measurements with sample types “Pre-Grab Online” and “Post-Grab Online”. These sample types are reported only for anions. The comparisons are matched by date, location, instrument and analyte.
Grab vs. Online	A grab sample concentration is measured with the analyzer, bypassing the normal sampling stream and compared with the measurement of the contemporaneous online stream. Detects and quantifies any effect of the online system (and pump intake location). The comparison is reported as the RPD of the two sample types “Grab” and “Online”. The comparisons are matched by date, location, instrument and analyte.
Field vs. Lab	A grab sample concentration is measured with two different analyzers, typically, the field analyzer and a lab analyzer, but two lab analyzer measurements can also be compared. Detects and quantifies the bias of analyzers. The comparison is reported as the RPD. The sample types are both labeled “Grab”. The comparisons are matched by date, location and analyte.
Standard vs. Instrument	A sample of a standard (KHP for organic carbon) is prepared with a known concentration, and the sample concentration is measured with an analyzer. The result reported is the percentage of the standard concentration. The sample type is labeled “Standard”
Matrix Spike	Grab samples are spiked with a known amount of an analyte (KHP for organic carbon) to estimate the effect of matrix interferences. The raw grab sample concentration is compared with the spiked sample concentration with the same analyzer (or method?). The spiked sample recovery compares the measured spiked sample

Test	*Description*
	concentration with the expected spiked sample concentration computed from the addition of the known amount of spike added to the grab sample. A consistent spike concentration should be used. The consistent concentration It may be different for different stations. It should also be at least 50% of the raw sample concentration. In practice, the spike concentration has varied.
Certified Standard	Concentrations of selected certified standards are measured with an analyzer (field or lab) or method to compare the result with the known concentration and established acceptance limits. The standard concentrations and acceptance limits are provided by an outside source. These samples are labeled “Standard Concentration”. Certified blank organic carbon samples with a nominal concentration of 0.0 mg/l are also used measured with the field and lab instruments to provide an estimate of instrument bias.

RPD

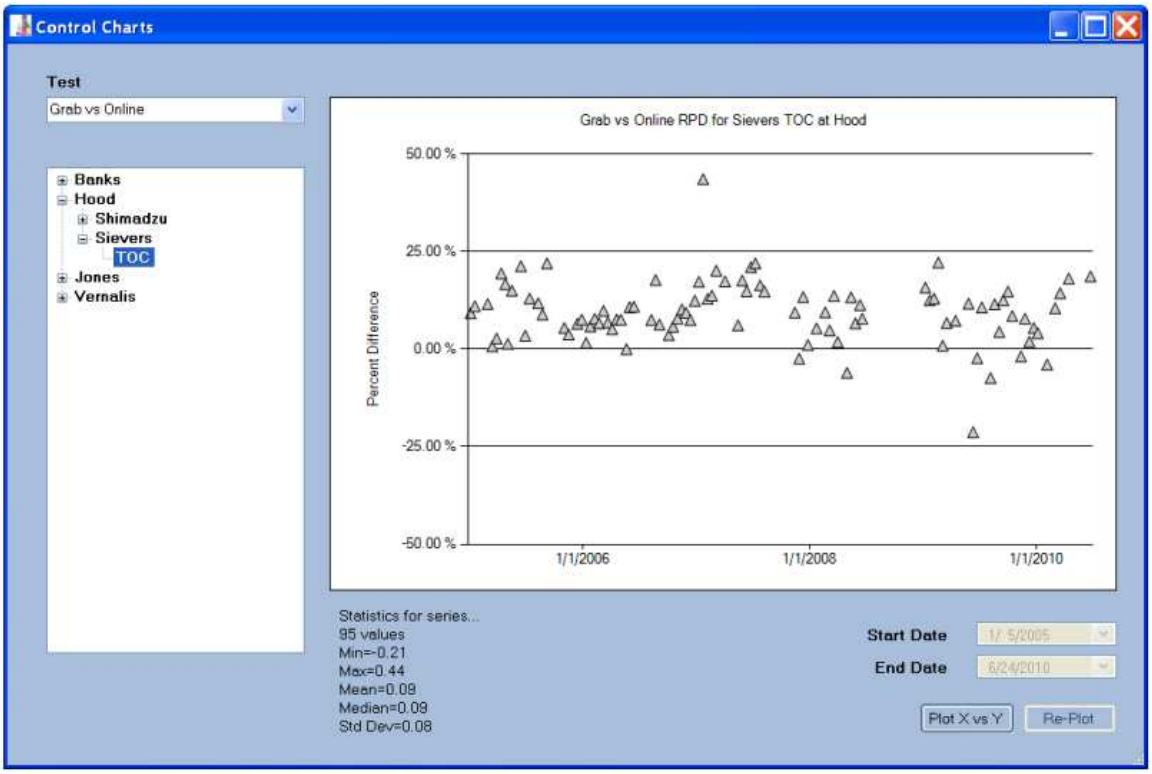
The RPD (relative percent difference) statistical test, a test of precision, is typically used in comparing two values. It is defined as the difference between the two values divided by their mean.

RSD

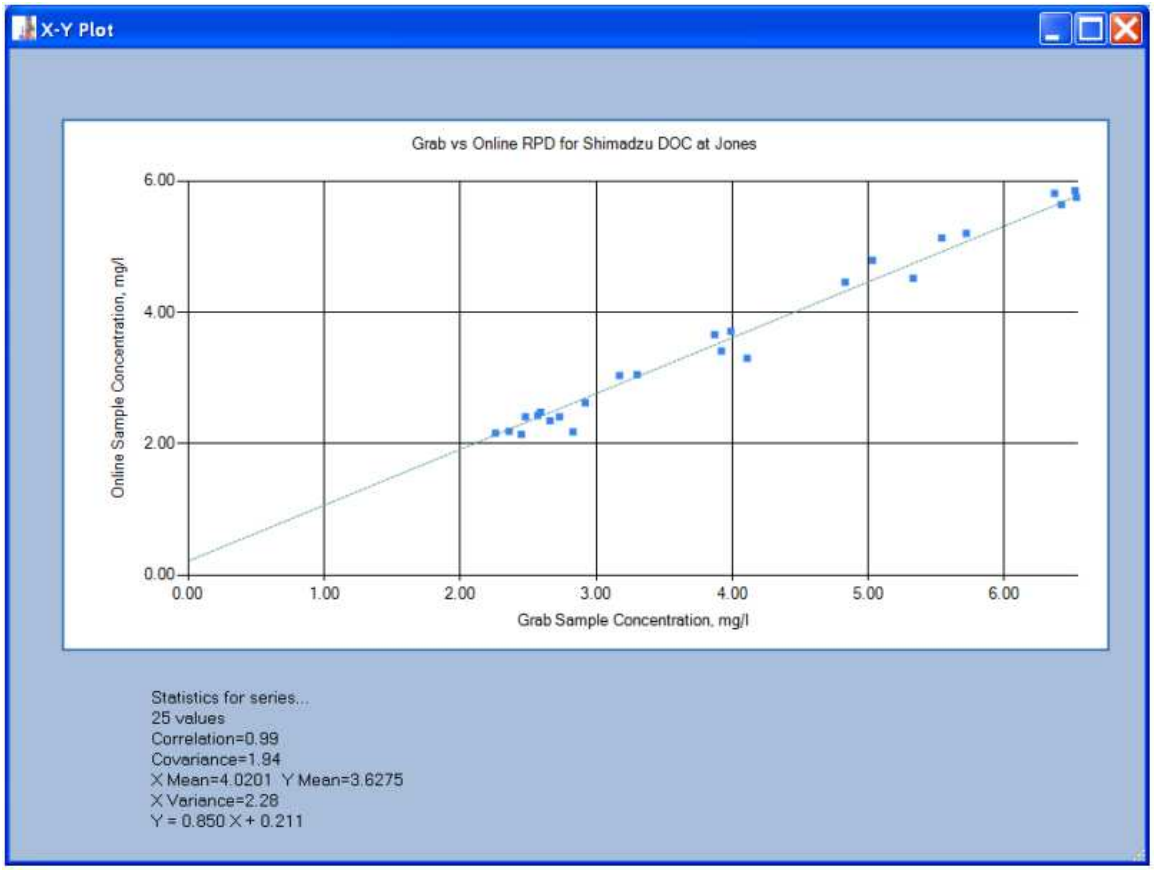
The RSD (Relative standard deviation) differences between measurements divided by the mean of all measurements) may also be computed for a group of comparisons with more than 2 values.

Analysis Tools

Control Charts



X-Y Plot


X-Y Plot
Grab vs Online RPD for Shimadzu DOC at Jones
Online Sample Concentration, mg/l
6.00
4.00
2.00
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Grab Sample Concentration, mg/l
Statistics for series...
25 values
Correlation=0.99
Covariance=1.94
X Mean=4.0201 Y Mean=3.6275
X Variance=2.28
Y = 0.850 X + 0.211